



Materials Engineering Branch

TIP*



No. 122 Reduction of Stress Corrosion Cracking Sensitivity of Machined 7075-T6

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One of the strongest aluminum alloys is 7075 in the T6 heat treat condition. However, the alloy with this heat treatment has very low resistance to stress corrosion cracking¹ (SCC) and may crack at applied tensile stress levels as low as 10% of its yield strength. Such susceptibility is greatest in the short transverse direction and somewhat less in the long transverse direction as related to the worked direction of the original stock.

TIP 013 explains more about aluminum alloy SCC. To achieve the T6 condition, the 7075 alloy is solution treated at 890°F, quenched and then precipitation hardened at 250°F for 24 hours. The rapid cooling (quench) results in a concentration of compressive stresses on the surfaces and also tensile stresses within the interior of the section.

Subsequent asymmetrical machining results in unbalanced stresses and high surface sustained tensile stresses. Therefore, SCC can take place under the influence of residual tensile stresses even in a clean room. Adding an 18-hour aging treatment at 325°F to produce a T76 heat treatment condition can substantially increase the resistance of this alloy to SCC. The T76 condition increases the short transverse SCC threshold stress from 7 ksi for the T6 condition to 25 ksi and changes it from a Table III to a Table II alloy.

This heat treatment can often be accomplished on finish machined piece parts without distorting them or changing their dimensional tolerance limits.

¹ "Guidelines for the Selection of Metallic Materials for Stress Corrosion Cracking Resistance in Sodium Chloride Environments", MSFC-STD-3029, Marshall Space Flight Center, Huntsville, Alabama 35812